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HUMIDITY REACTIONS OF WORKERS AND SOLDIERS OF *ODONTOTERMES MICRODENTATUS* ROONWAL & SEN SARMA AND *ODONTOTERMES OBESUS* (RAMBUR) IN A HUMIDITY GRADIENT APPARATUS AT A CONSTANT TEMPERATURE*†

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ABSTRACT

The humidity reactions were studied in a humidty gradient apparatus. All the experimental workers and soldiers of *Odontoterms microdentatus* Roonwal & Sen Sarma and *O. Obesus* (Rambur) were kept in an atmosphere of high humidity prior to their release in the apparatus. The time required by these termites to register a positive response to the humid zone was rather long in both the species of *Odontotermes* as compared to other species of termites. The response of workers was much faster than the soldiers. The humidity preferendum seems to be about 93-95% which coincides with the relative humidity as measured inside the mound.

INTRODUCTION

The animal behaviour and their relationship existing with the environment have been earlier investigated by the several workers in terms of physical factors such as temperature, relative humidity and light (Gunn 1934, Franenkel & Gun 1940, Deal 1941, Ewer & Ewer 1942, Dakshinamutry 1948, Aziz 1957, Hafez & Makky 1960). Of these three factors, humidty is known to be of more ecological importance in the lives of insects and other terrestrial animals. Except for the work of Williams (1946), Emerson (1956) Ernst (1957) and Sen-Sharma and Chatterjee (1966), there is very little on record regarding the work on these lines in termites. Further, humidity reactions of not even single mound building termite species, has yet been reported this is an attempt to fill up the exiting gap in case of mound building termites.

MATERIAL AND METHODS

Humidity behaviour was studied in a humidity gradient apparatus similar to one used by Sen-Sarma and Chatterjee (1966). It consisted of a rectangular tray (33.5 × 14.5 × 3.5 cm.) made out of a galvanized iron sheet. Its inner space was divided into seven equal compartments on either side

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of a central open passage which was 5 cm. wide. The wall separating the side compartments from the central passage was kept low so as to facilitate diffusion of water vapour from the compartments to the central passage (Fig. 1). Smooth polythene foil was glued on the side wall of the apparatus with a view to preventing termites to climb up the side wall and escape. The saturated aqueous solution of the appropriate inorganic salts was kept in plastic dishes in the side compartments as follows : (i) Calcium chloride (fused) in one pair of end chamber (No. 1), (ii) saturated aqueous solution of NaCl in the middle pair of chambers (No. 4) and (iii) distilled water in the remaining pair of end chambers (no. 7). A humidity gradient of 43%, 55%, 65%. 80%, 85%, 93% and 95% was obtained (Fig. 2). Relative humidity obtained in different compartment were checked by means of a hair hygrometer. Fluctuations did not exceed ± 2%. All the experiments were performed in an underground cellar where a temperature of 28°C ±1°C was maintained.

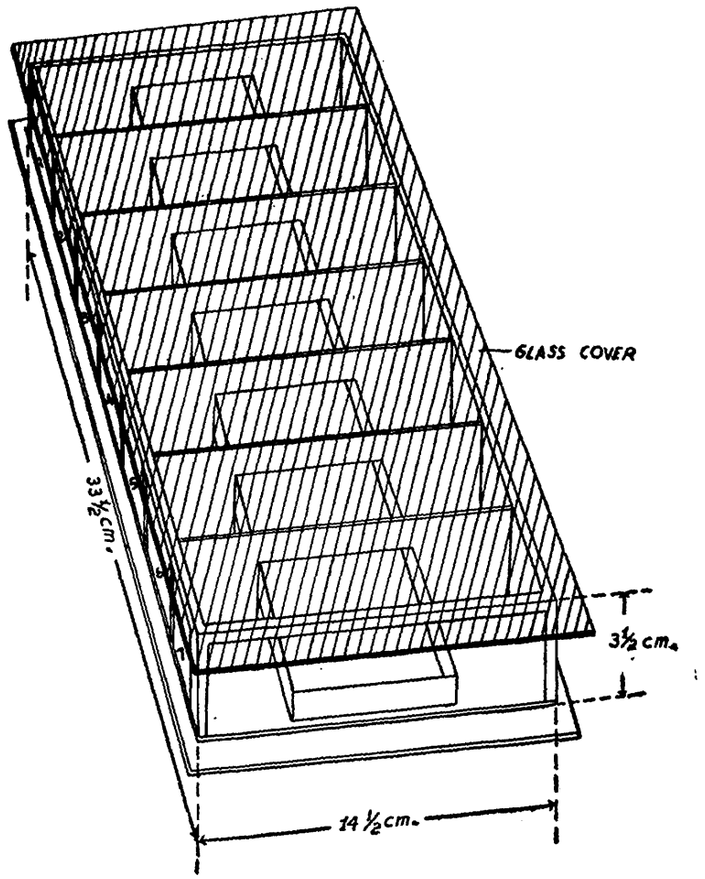

Fig. 1, The schematic Diagram of the humidity gradient apparatus made out of galvanized iron sheet.

Healthy workers and soldiers of each species were only used. The termites were extracted from the fresh fungus combs and were kept in high humidity before their release in the apparatus. A total of ten experiments containing 10 termites in one

batch for each caste of each species was performed. The temites in five experiments were released from humid side, and in other five experiments, they were released from dry side. After completion of one experiment, the central eliminate passage way was swabbed with alcohol to eliminate possible odour trails as suggested by Emerson (1956). Observations for the position records were made hourly upto three hours. The intensity of humidity reactions has been expressed as the excess percentage ratio of termites on the humid zone (93-95 % R.H.) and was calculated by using the formula $100 \times \frac{W-D}{W+B}$ (Gunn & Gosway 1938) and the percentage of termites present in the humid zone was calculated using the formula $100 \times \frac{W}{W+D}$ (Sen-Sarma and Chatterjee 1966), where W represented the number of position records in the humid zone (93-95 % r.h.) and D the number found in the dry zone (43-85 % R.H.).

The control experiments were conducted in an isohygrous condition without the gradient of air humidity. It was observed that experimental termites did not show any preference for any chamber except for a very weak thigmotactic reaction to end chambers and sides.

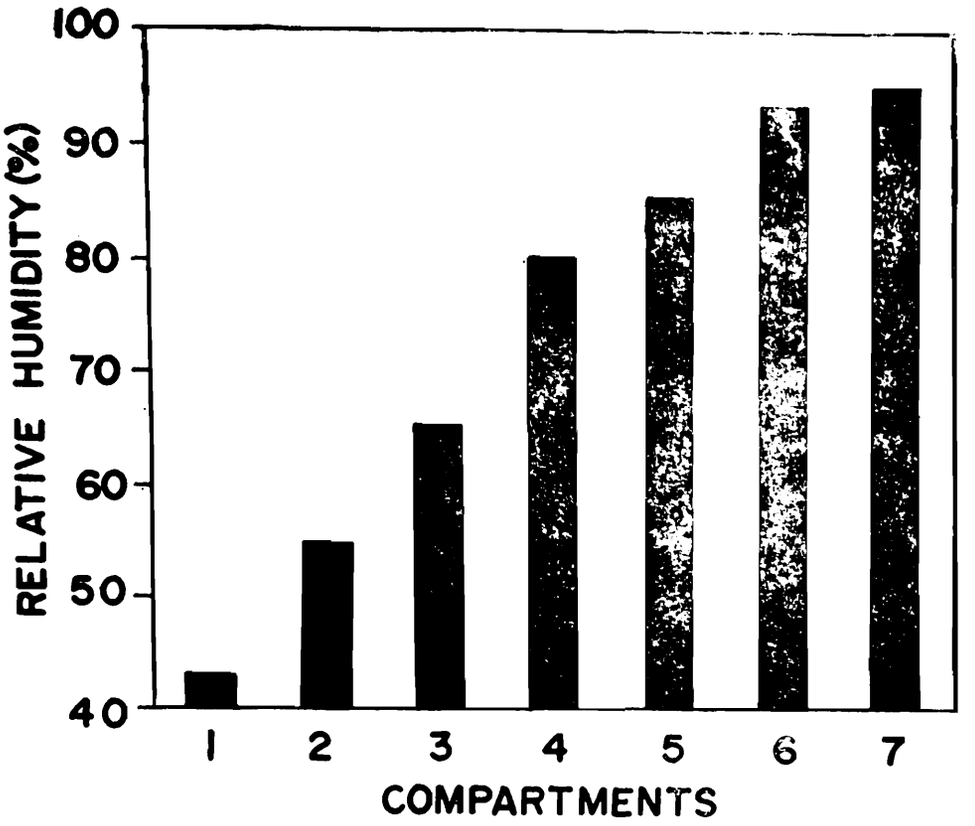

Fig. 2. Relative humidity (in percent obtained in different compartments of the humidity gradient apparatus.

RESULTS AND DISCUSSION

The intensity of humidity reaction of workers and soldiers and the percentage of workers and soldiers recorded in the humid zone at different intervals of time in *O. microdentatus* (Figs. 3A & 4A) and *O.*

obesus (Figs. 3B & 4B) have been depicted.

The time required to register a positive response of these termites to the humid zone was rather long in both the species of *Odontotermes* as compared to the duration reported by Emerson ' (1956), Ernst (1957) and Sen-Sarma & Chatterjee (1966) for other species of termites. The slower response to high humidity may be due to the fact that the experimental termites were stored in an atmosphere of humidity before their release in the humidity gradient apparatus and the response of insects to varying humidity are governed by the humidity conditions to which have earlier been exposed (Gunn and Cosway 1938, Perttunen 1951, Parker 1952, Hafez and Ibraheim 1964). Sen-Sarma & Chatterjee (1966) also observed slower response to high humidity in case of wet preconditioned workers than the dry preconditioned workert in *Microcerotermes beesoni.* It is significans to note that the response of workers was

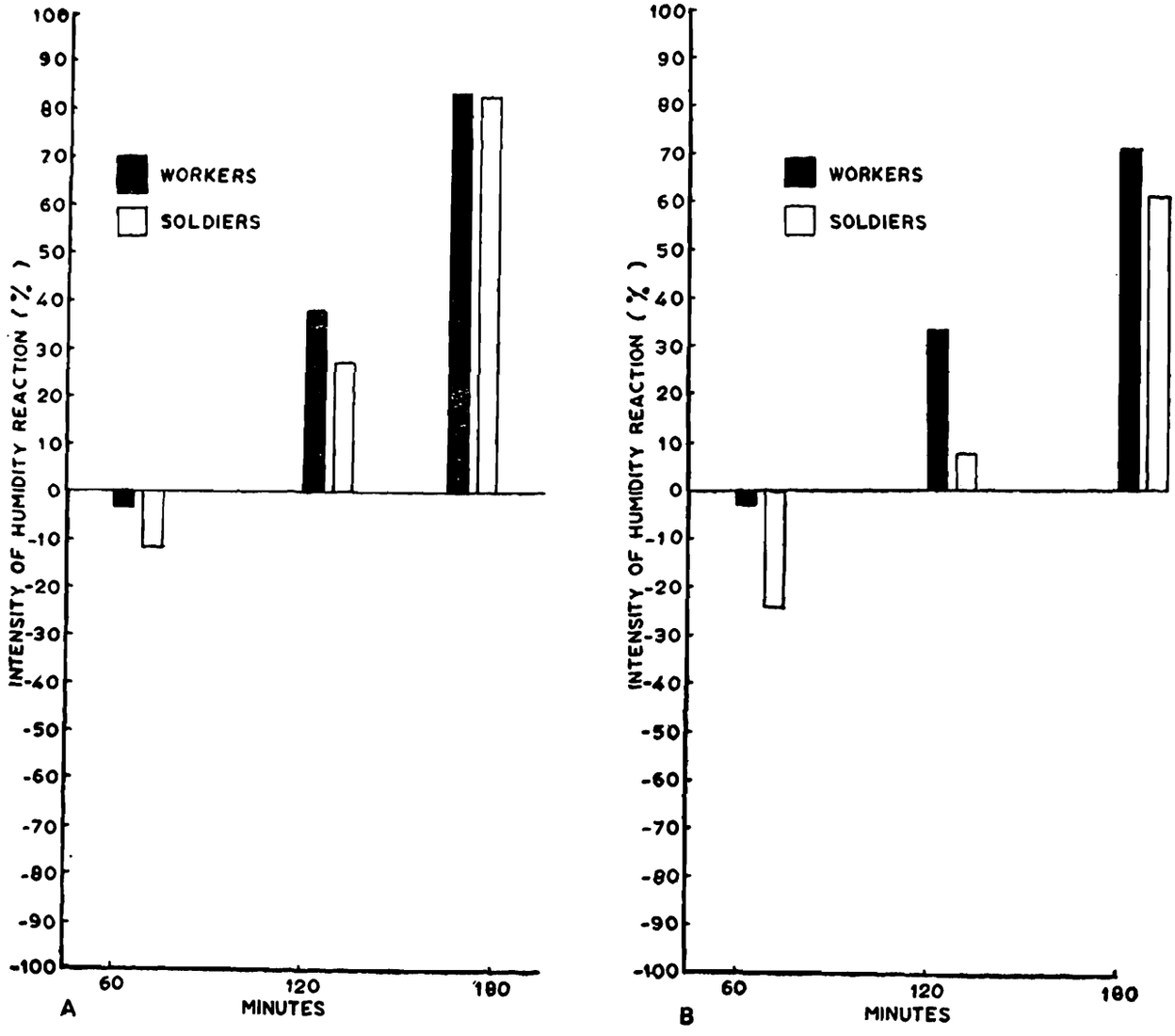

Fig. 3. (A & B) Intensity of humidity reactions expressed as the excess percentag ratio of termites in the humid zone (93-95%) of workers and soldiers of A. *Odontotermes microdentatus* to humidity gradient. B. *Odontotermes obesus* to humidity gradient.

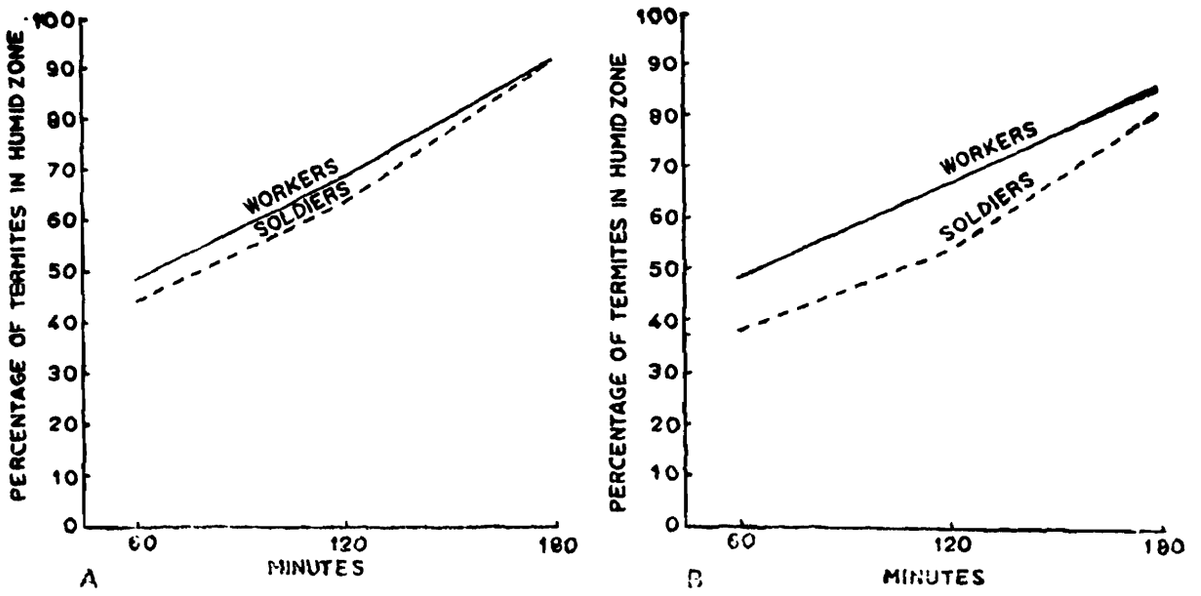

Fig. 4. (A & B) The percentage of workers and soldiers in the humid zone at different intervals of time in A. *Odontotermes microdentatus*. B. *Odontotermes obesus*.

much faster than in the soldiers in both the species. Emerson (1956), however, did not find any difference in humidity response of soldiers and workers in *Termes panamaensis, Nasutitermes nigriceps, N. columbicus* and *Amitermes foreli.* The slower orientation of soldiers to high humidity than in workers is apparently due to slower rate of water loss from the body of soldiers. The higher survival period of soldiers than that of the workers under different combinations of temperature and relative humidity (Agarwal, unpublihed, a, c), also tends to support to this contention. The humidity prefrendum, therefore is about 93.95% R.H. which also follows with the rela ive humidity (92-96% R.H.) measured inside the mound (Agarwal & Sensarma, unpublished ; Agarwal, unpublished, b).

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